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*Pathology of Cancer and Tumours
of the Bladder.
by
Gilbert Barling*

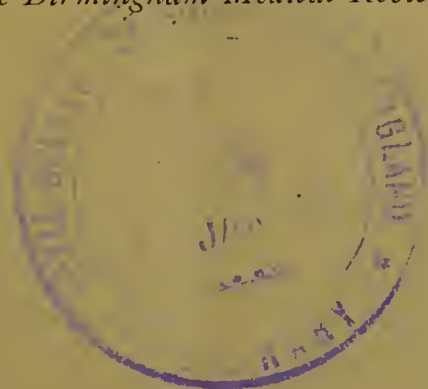
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THE PATHOLOGY OF THE INNOCENT TUMOURS OF THE BLADDER.

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PAPERS published by me (1 and 2) have dealt with the pathology of the malignant growths of the bladder at some length. In the present I propose to describe fully those tumours which may be grouped together as innocent, a brief description of which I have published. (3)

Classification.—At the outset one is met with the difficulty that although typical specimens of the various classes are easily distinguishable, yet there are some intermediate ones, which are assigned with hesitation to a definite class. Instances of this difficulty are to be found in many of the firmer (or fibro) papillomatous growths, approximating on the one side to the “villous” or fimbriated papillomas; on the other to the fibro-myomas, or to the transitional tumour of Sir H. Thompson.

The myomas, or fibro-myomas, occasionally almost merge into the sarcomas, and even in the carcinomas it is not always easy to indicate the exact designation which should be applied to any particular tumour.

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1. *Illustrated Medical News*, Vol. I.
 2. *Birmingham Med. Review*, March, 1890.
 3. *Birmingham Med. Review*, May, 1888.

The classification which follows therefore may not be a final one, but it appears to be the best at present attainable and which future investigation will possibly modify.

<i>Innocent.</i>		<i>Malignant.</i>		
Papilloma	{ Fimbriated Fibro-	Sarcomas	{ Round Cell Spindle Cell Mixed Cell Alveolar Lympho- Myo- or Fibro-	
Fibroma			Carcinomas	{ Squamous Cell or Epithe- lioma Alveolar or Encephaloid & Scirrhus
Fibro-Myxoma, Myxoma				
Myoma, Fibro-Myoma				
Adenoma				
Angioma				
Enchondroma				
Dermoid				
Hydatid				

Of the total number of cases inquired into and examined, viz., 260, 141 were innocent and the remainder malignant tumours, but it is probable that this does not represent their relative frequency, and that the proportion of innocent growths is greatly exaggerated. The explanation of this no doubt is that the clinical interest of innocent tumours has led to their being described or preserved, where the malignant ones have been ignored or thrown away.

Other writers on this subject have made the most diverse statements, the discrepancy no doubt arising from the above-mentioned cause. Pousson, in his work on Tumours of the Bladder (Paris, 1884), makes the proportion—innocent tumours, 138; malignant, 67; the total being obtained by aggregating statistics from various sources; but he points out that in Fere's cases, in which the anatomical nature was stated (numbering in all 82), 55 were malignant, and the rest vaguely spoken of as villous. Further, he finds that of the specimens preserved at the Necker Hospital 9 are innocent and 9 malignant. The cases recorded by Sir Henry Thompson, of which I have cognisance, makes the proportion of innocent tumours even greater than in the already-mentioned statistics; for of 30 tumours 26 are innocent, if we include 6 described as transitional, and which are probably either inflamed fibromas or fibro-myomas. This disproportion in Thompson's cases is

doubtless explained by the fact that they are mainly records of those in which operations have been performed, from the benefit of which many cases of malignant tumour would be excluded. As a last example of the difficulty one has in arriving at a correct estimate on this point, it is worthy of notice that the reports of University College Hospital for 1880 to 1885 contain details of 12 cases, of which 10 are malignant.

Amongst the innocent tumours the papilloma is by far the most common; for of a total of 141, 89 came under this category. The fibromas, fibro-myxomas, and myxomas together number 28; the other groups each only contain a very small number. Among the malignant tumours available for statistical purposes the carcinomas predominate, being 72 in number, as compared with the sarcomas, which amount to 34; but it may very well be that these numbers do not represent the actual frequency of the two kinds of growths, for many malignant tumours have in times past been called cancerous, epithelioma, or scirrhus, without any attempt to determine their exact nature, and so, many sarcomas have been overlooked; whilst of late years, interest having been aroused in them, numerous examples of sarcoma have been carefully recorded, and the commoner growth carcinoma has been passed over in silence; hence there are two sources of possible error.

PAPILLOMA.

The term villous has hitherto been commonly applied to this kind of tumour, as it offers a very ready description of its naked eye appearance, and to some extent of its histological character. It has the disadvantage however of dislocating the classification of bladder tumours from that of other systems, for instance, that of the skin; and further, it has been loosely applied, even to malignant tumours, and is to a certain extent answerable for the confusion existing between growths of very different natures.

In describing the papillomas it is necessary to adopt some sub-division which, though retaining them in the same class will

yet enable us to point out some histological and general characteristics in which they differ from one another.

A convenient division is that suggested by Sir Henry Thompson, into fimbriated papilloma and fibro-papilloma. It must be borne in mind, however, that this separation is to a certain extent artificial, and though characteristic examples of each are easy to delineate, yet the two groups pass insensibly one into the other; and even in the same bladder, fimbriated and fibro-papilloma may exist side by side.

Fimbriated papilloma commonly arises from the surface of the bladder by a narrow base which often forms a pedicle of some length, from a quarter to half an inch or longer. This main stalk breaks up into secondary ones, and these again sub-divide perhaps more than once, the whole presenting, especially if floated out in water, a finely shaggy or "villous" appearance.

Occasionally, instead of arising by a pedicle, a number of sessile filiform processes, from a quarter to an inch in length, spring directly from the mucous membrane, forming a tuft of fine papillæ like a bunch of young grass. Examined microscopically, the pedicle, if one exists, consists of ordinary fibrous tissue, with perhaps a small admixture of involuntary muscular fibre, and bears a number of vessels with fairly developed walls.

The secondary divisions have a similar formation, but the fibrous tissue in the centre becomes less in proportion than in the primary trunk, and the vascular supply becomes more and more remarkable in extent, whilst the walls of the vessels become less substantial. Finally, each terminal papillary process consists of a column of very delicate fibrous tissue with a central blood vessel, of large size in proportion to the fibrous tissue, and with very delicate walls in which a few nuclei may be detected. Eventually the vessels look like large capillaries with scarcely any surrounding fibres. Covering each papilla are several layers of columnar or spheroidal epithelium separated from the fibrous tissue, or from the vessel walls on which it appears at times to rest directly, by a basement membrane.

The epithelium sheds extremely easily, so that great care is necessary to make successful sections, and the best method to obtain them is to imbed the growth in celloidin. If the section happens to cut transversely across some papillæ packed together, an alveolar appearance may be presented, which is suggestive of an adenomatous growth. Not infrequently there is a certain amount of small celled infiltration into the fibrous part of the tumour, especially is this likely to be the case if cystitis has been present, and it is a condition no doubt due to inflammation, the small round cells being escaped leucocytes or proliferated cells. In the microscopic drawing (No. 1) small patches of



Papilloma (Fimbriated).

Microscopic drawing No. 1.

myxomatous tissue may be observed, also with a certain amount of leucocytic infiltration.

Fibro-papilloma arises either by a broad base or is quite sessile in its attachment and is altogether a more solid growth than that just described, and appears to be more intimately connected with the coats of the bladder. Springing from the surface of the solid base are papillary processes, which may or may not undergo sub-division, but they are generally shorter and coarser than the delicate papillæ of the fimbriated variety.

Examined microscopically, the base of the growth consists of a mixture of fibrous tissue and involuntary muscular fibre, the latter being considerable in amount. The blood vessels are numerous, with well developed walls. All these constituents are prolonged into the papillæ, but the muscular fibres only in small amount, and they are generally lost before the termination of the processes are reached. The fibrous tissue is also diminished and the blood vessels lose their well developed walls, and shew finally as simple capillaries, but their calibre is exaggerated in proportion to the stroma in which they lie. Clothing the whole growth are numerous layers of epithelium as found in the first variety. There is usually a certain amount of small celled infiltration into the solid part of the tumour, and to some degree this prevails also in the papillæ.

Either form of growth may be found coated with phosphates, a condition to be borne in mind, as it appears at times to have given rise to the belief, from examination by the sound, that a calculus existed. As has already been pointed out, it is difficult to take every specimen, and say this is a fimbriated, or a fibro-papilloma; indeed the same bladder may contain examples of each form, (see Anderson, *Tr. Chir. Soc.*, vol. xviii.) Further, it is worthy of remark, that after a fimbriated papilloma has been removed, if it recurs, the recurrence is not unlikely to be firmer and more solid in its character, partaking in fact of the characters of fibro-papilloma. Instances are recorded by Pitts in *Med. Press and Circular*, 1. 12. 86. and by Alexander in the *Lancet*, 17. 8. 78. and a specimen is in St. 'Thomas' Hospital Museum, BB. 28, 2.

With regard to the frequency of the two varieties it is not

easy to speak positively, as many authors are content to record their cases simply as "villous," or "papilloma," without attempting to draw any fine distinctions. But turning to Thompson's cases, the fibro-papilloma would appear to be the commoner; although this is not borne out by examining such reports from medical literature as allow one to form a conclusion on this point. Here the result makes the fimbriated to the fibro-papilloma as 12 to 10. The main and important difference between the two forms is a clinical one, and will be alluded to later on. Whichever the variety, it may exist in a single or in a multiple form, the first being rather the commoner of the two. Not unfrequently two or three distinct patches may exist, either fairly close together or on opposite walls of the bladder. (Drawings No. I. and No. II. from the Museum of Queen's College, Birmingham, illustrate the single and the double tumour.) Again, there may be one main tumour and a wide patch of sessile papillæ attached around it, or to some more distant part, giving rise to a condition like the pile of velvet. Such is a specimen (1469) in University College Hospital Museum. Instances are recorded where half a dozen or more distinct growths were found scattered over the whole interior of the bladder. Such a one is figured by Hudson in the *Dublin Journal of Medical Science*, 1879. In this instance there were eight distinct tumours attached by narrow pedicles. A similar specimen exists in the Museum of St. Thomas' Hospital, BB. 28, and in an unpublished case under Mr. Jolly at the General Hospital, there was at least a score of small papillomas, generally with short but distinct pedicles. These tumours were removed by the median perinæal operation.

The connection of the tumour to the bladder may be either by pedicle, or by a wide base which may be described as sessile, but the commonest method of attachment is certainly by a pedicle; this however may vary in size from a number two catheter to that of the little finger. Hudson's sketch illustrates the finer kind, whilst a drawing of Bartons' case in the *Dublin Medical Journal*, 1881, and (No. 1.) from Queen's College,

Birmingham, shew very well the thicker form of pedicle. Many tumours are described as being broadly pedunculated where perhaps the summit is about one and a half times as large as the



Drawing No. I.

Papilloma in Queen's College Museum, Birmingham.

The Bladder is everted and the tumour divided vertically to shew its pedicle more distinctly. *a* marks the Urethra.

base, and this merges into the sessile form which gives the idea of a solid projection of the whole bladder coats into the tumour. There is a variety of the sessile attachment to which allusion

has been made when speaking of the fimbriated papilloma. Here long filiform processes arise directly from the mucous membrane, but without the intervention of firm solid out-growths. Speaking generally the fimbriated papilloma is a pedunculated growth with the exception just alluded to, whilst the fibro-papilloma tends to a sessile attachment.



Drawing No. II.

Two Papillomas in same Bladder, from Queen's College Museum, Birmingham.
Bladder everted, shewing a tumour near each Ureter. That on the right side is turned back to shew its pedicle at *a*.

The deep origin may be traced in all cases to the mucous and sub-mucous or vascular coat, and from the latter no doubt these

growths derive their remarkable vascularity. In those tumours with more solid pedicles or bases a deeper source is found for the involuntary muscular fibres contained in them, viz., the delicate internal longitudinal layer of muscular fibres, or as it is called by Ellis the sub-mucous muscular coat.

The size of the growth is not appreciated properly either before removal or afterwards unless it is floated out in water, as the delicate processes shrink so, and reduce the tumour to much less than its living proportions. Amongst the largest described are one by Thompson (Suprapubic Cystotomy, 1886,) the size of an orange, and one by Yarrow (*Journal Amer. Med. Ass.*, 1886), where the size was that of half a fist. The commonest size is that of a chestnut or walnut, though several are described as of not more than half those dimensions. The favourite locality for papilloma is the base of the bladder, and if the cavity of the organ were divided into three equal portions, at least two thirds of the tumours would be found in the lowest segment, and the remainder would be about equally distributed over the middle and superior divisions. Going into the matter more in detail, it is seen that the immediate neighbourhood of the ureteral orifices give rise to a very large number, for in 74 cases, 11 are described as commencing near the right ureter, 2 near the left, 9 between and around the ureters, 15 from the trigone and its vicinity. In a few instances the anterior or posterior walls were affected, and in nine cases the superior wall was the starting point. Nine times the growths were diffused practically all over the bladder, but apart from these it is occasionally noted that the base and both sides, or the anterior and the posterior walls were the parts affected. It is curious to notice that the right ureteral orifice is much more often involved than the left.

The male is very much more liable to be the subject of papilloma than the female, almost in the proportion of four to one. On this point Stein, "A study of Tumours of the Bladder, 1884," comes to a very different conclusion, as he finds that out of 30 cases collected, 16 were females, whereas in the statistics

from which these remarks are compiled, 63 cases were males and 17 females. In Sir Henry Thompson's records, 14 were males and 3 females, which gives the males even a greater preponderance than four to one, and there can be little doubt that Stein was in error.

The ages of the patients suffering from this disease, at the time they came under observation, varied from 16 to 85.

The actual number in each decade was as follows:—

1 to 10	...	0	30 to 40	...	16	60 to 70	...	19
10 to 20	...	2	40 to 50	...	11	70 to 80	...	4
20 to 30	...	3	50 to 60	...	16	80 to 90	...	0

from which it appears that 60 out of a total of 72 were between the ages of 30 and 70, over which period they were pretty evenly distributed, a result which might naturally be expected, as it is during this period that the bladder is most exposed to irritation; further, the almost complete absence of the disease before adult life is remarkable.

It is convenient here to enquire what is the length of life of patients affected by papilloma of the bladder when the course of the tumour is not cut short by operation. Of 25 cases available for this purpose

5 died in less than 1 year after the commencement of symptoms					
3	"	"	2 years	"	"
5	"	"	3	"	"
1	"	"	4	"	"
2	"	"	5	"	"
2	"	"	8	"	"
2	"	"	12	"	"
1	"	"	14	"	"
2	"	"	15	"	"
1	"	"	16	"	"
1	"	"	17	"	"

from which it will be gathered that sixteen, or nearly two thirds, died before the expiration of five years. The average life appears to be a little over six years. This matter will be referred to again under prognosis.

Although doubt has existed in times past as to the innocent nature of papilloma, or as it was commonly called "villous"

tumour of the bladder, yet this may now be regarded as finally settled. Rokitanski described and figured "Villous Cancer" in 1852; and reference to his paper shews obviously either that he was writing of simple papilloma, which he speaks of as arising from the deep layers of the mucous or from the sub-mucous coat, or else that he was examining the papillomatous surface of a growth whose base was really malignant. Whichever may have been his material, there is nothing in his description to justify the use of the term "cancer;" but unfortunately for a long time his views were accepted. Hence, at the present time many papillomas in museums are labelled "Villous Cancer."

Another reason for error is the papillary surface found on many maglignant tumours, whether sarcomas or carcinomas, in which it occasionally happens that the surface alone being examined an incorrect diagnosis is made, and secondary growths being found, a suspicion of malignancy becomes attached to the papillomas.

These have in reality all the characteristics of innocent growths; they do not infiltrate the coats of the bladder; there is no epithelial in-growth, such as characterises the earliest stage of epithelioma; they do not give rise to secondary growths, either in the glands or in more distant parts, nor do they invade the tissues adjacent to the bladder, and they are free from the destructive ulceration which so commonly involves the malignant tumours of this as of other organs. It is true they occasionally recur after removal, but this is due to imperfect removal, and the same course would be pursued by an incompletely removed papilloma in any part of the body without justifying its condemnation as malignant.

Whilst there can be no doubt of the innocent nature then of a pure papilloma, it is necessary to investigate all tumours of the bladder more thoroughly than is often done for two reasons; one has already been alluded to—it is the frequency of papillary formation on the surface of malignant growths; the other is the tendency papilloma occasionally has to become carcinomatous, a tendency which it shares with papilloma of other parts,

The evidence on this latter point is quite conclusive in several instances, and it is a fair inference in others. A case is published by Alexander in the *Lancet*, 17. 8. 78. in which four operations were performed on the same patient, whose symptoms extended over seven years. At the first three operations the growth was undoubtedly simple papilloma, but at the last it was quite as certainly carcinoma. The microscopic examination was made, both of the innocent and malignant growths, by Mr. F. T. Paul.

Posner, in the *Berlin klin. Woch.*, 1883, describes a case in which symptoms of bladder tumour existed for nine years before death. The *post mortem* shewed a large tumour on the left side of the bladder made up of scirrhous, encephaloid, and colloid carcinoma, whilst on the right side was a small papilloma. Posner concludes that there had been conversion of a papilloma on the left side into a carcinoma, but it is possible that the earlier symptoms were due to the papilloma on the right side which still retained its innocent character, whilst the malignant growth was of much later development, and was cancerous from the first.

Barton, in the *Dub. Med. Journal*, 1881, describes a tumour of the bladder in a female, who had suffered from it for three years. At the *post mortem* examination a pedunculated growth was found which to the naked eye appeared to be a typical papilloma, and Barton's drawing would make such a conclusion appear a very justifiable one; but near and around the insertion of the pedicle there was an ulceration, and a very careful microscopic examination by Dr. P. S. Abraham shewed evidence of carcinomatous infiltration in the pedicle and the base. There can be little doubt that a tumour originally a papilloma was undergoing malignant degeneration.

Stein (*loc. cit.*) records a case of carcinoma in which symptoms of tumour of the bladder had existed for seventeen years, and which he concludes was originally an innocent growth. A similar conclusion is almost inevitable in a case described by Thompson (*Path. Soc. Tras.*, v. 18), the specimen being preserved in the Univ. Coll. Hosp. Museum.

FIBROMA, FIBRO-MYXOMA, AND MYXOMA (?).

Included in this class are twenty-eight examples; but the histological reports of many are too incomplete to allow of their being accurately divided into two distinct divisions, though a majority probably belong to the former. There are, however, certain general distinctions to which attention will now be directed.

First of all, it would appear that the fibromas commonly occur in adult life, while the fibro-myxomas are found almost invariably in young children from the age of one year up to ten, and probably some of them are congenital. On this point Winckel's observation is interesting (*Handbuch du Frauen Krank*). He found two small mucous polypi, the largest the size of a pea, in the bladder of a child who died thirty-two hours after birth.

Secondly, the fibromas are single growths usually, but the fibro-myxomas are multiple, and occasionally involve parts adjacent to the bladder, as in Marsh's case, where the vagina and vesico-vaginal septum were also affected (*Path. Soc. Tr.*, v., 25).

Thirdly, whilst both forms of growth are more or less pedunculated, the fibro-myxomas generally involve a wider surface of the bladder in their origin, and often the mucous membrane around is thick and sodden to the touch and covered with small sessile projections.

In contradistinction to the papillomas, these tumours more often affect the female than the male sex. The site commonly assigned to them is about the neck, the orifice of the ureters, or the inferior wall of the bladder; but occasionally the anterior or the posterior wall is the locality to which they are attached.

I have had no opportunity of investigating a pure fibroma, for in museums they exist but very rarely, probably because they have been amenable to successful treatment for many years past and no fresh specimen has offered itself for examination. There can however be no doubt that some tumours

described as fibromas, if more fully investigated, would be placed in other classes. An instance of this is specimen No. 2,419 in St. Bartholomew's Museum, and described by Mr. Savory in the *London Times and Gazette*, 1832, as a fibroma, and which is in reality an alveolar sarcoma. Mr. Birkett described and figured a fibrous polypus from a child's bladder in Vol. 41 of the *Med. Chir. Trans.*, but the microscopic examination made by Dr. Wilkes suggests that it would be better classed with the fibro-myxomas.

The best instance recorded of a fibroma appears to be a case by Gersuny in the *Arch. f. klin. Chir.*, 1872. The tumour was of the size of a hen's egg, and was attached by a very slender pedicle to the interior of a diverticulum. It is described as consisting of undulating connective tissue and some spindle-shaped cells.

A case of fibrous polypus in a female aged sixty is mentioned by Godson in the *Brit. Med. Jour.*, Vol. 1, 1879. It was attached by a narrow pedicle, and consisted of "fibro-cellular tissue with a few involuntary muscular fibres."

Another very similar to this occurred in a patient of Berkeley Hill's (*Med. Chir. Trans.*, Vol. 65). When fresh, the growth was like a mucous polypus of other surfaces, and examined by Boyd microscopically it was found to consist mostly of fibrous tissue more or less infiltrated with small cells, and in places like an alveolar sarcoma, whilst its base contained a few involuntary muscular fibres.

This much appears to be clear about the fibromas. As a rule they are single tumours taking their origin from the mucous membrane, to which they are attached by a pedicle, generally of very small size. They occur in adults, being scattered between the ages of twenty and sixty, and they have a predilection for the female rather than for the male sex. Like most other tumours of the bladder, their site is commonly from the base of the organ, especially from the vicinity of the ureters, but occasionally, as in one removed by Bazy, from the anterior wall.

The fibromas, although at times under suspicion as to their exact nature owing to the presence of a certain amount of young cell growth in them, seem to be quite innocent, for in no case recorded is there evidence of recurrence after removal.

Fibro-Myxoma, and Myxoma.—It has already been pointed out how closely these tumours trench upon the last described, mainly because sufficient care has not been taken to distinguish between them; and it is almost certain that some regarded as mucous polypi belong to the fibromas. Such an instance is specimen 3691 in the Museum of the College of Surgeons, the bladder of an adult in which is a so called mucous polypus the size of a nut, and attached by a very delicate pedicle. From the age of the patient, the tenuity of the pedicle, and the healthy condition of the adjacent mucous membrane, we cannot but surmise that it is a fibroma.

I have had the opportunity of examining microscopically two specimens of fibro-myxoma, one in University College Hospital Museum, No. 1471 E., the other in Queen's College, Birmingham. The basis of the growth consists in each case of very delicate connective tissue which is in places interwoven in the most irregular manner, and looking, from the curliness of some of the fibres, as though it contained a certain amount of elastic tissue of unusual delicacy. In other places the connective tissue fibres run regularly side by side, and here the mucous inter-cellular tissue is most noticeable. Imbedded in the connective tissue, but more especially near the free surface, are numerous cells, round, spindle, or irregular in shape; into a few of these, delicate processes from the connective tissue may be traced, though this is exceptional, and some stellate cells, such as are seen in pure myxomas, can be found.

In the central parts of the section the blood vessels are rather numerous, and have fairly thick walls apparently of condensed fibrous tissue and without any regular muscular coat; as the vessels approach the surface they break up into numerous thin-walled capillaries which lie at a pretty regular depth from the surface of the growth, which is covered fairly evenly with

epithelium, such as is found on the adjacent mucous membrane. The section from the tumour at University College Museum contains more cellular growth than the other, and in places blood corpuscles are also noticeable, both of which conditions are due probably to the irritation and partial strangulation to which a portion of the tumour was exposed from its being protruded into the urethra. Examination of the base of these tumours shews a much larger proportion of fibrous tissue and fewer cell elements.

Whether a pure myxoma has ever been found in the bladder is doubtful, although two or three have been mentioned, but without such an account of the microscopic characters as would allow of their being identified.

The fibro-myxomas arise from the mucous and sub-mucous coats of the bladder, and in the specimen in Queen's College, Birmingham, the tumours can be stripped off by a little dissection, leaving the muscular coat healthy and uninvolved. To the naked eye they present much the appearance of firm nasal polypi, or of the so-called hydatids of the chorion, and look, when full of blood, like clusters of red grapes.

There are commonly several growths, taking origin by pedicles which at the bladder surface run almost one into the other, presenting the appearance at first sight of a single multilobular tumour. The lobules vary in size from a pea to a hen's egg, the smaller ones being but slightly pedunculated, and occasionally having a rather warty appearance, as seen in a drawing of Birkett's (*Med. Chir. Trans.*, v., 41). The larger lobules are subdivided into secondary lobules, which exactly resemble those springing primarily from the mucous membrane. Often there is one main mass which has a great tendency to protrude into the urethra, a circumstance which will be alluded to later on. The mucous membrane for some distance around the tumour is thickened, and may present tiny excrescences indicating the development of more growths. The site most commonly affected is the base of the bladder or the neck, around which a circle of tumours sometimes forms, and it is

not rare to find an area of some inches involved in the attachment. In a specimen (2104, 28) in Guy's Hospital Museum the growths are widely diffused. The female sex is more often affected than the male.

Fibro-myxoma occurs almost invariably in childhood—many of them indeed before the second year of life—suggesting, from the bulk then reached, that they were really congenital, an idea which is confirmed by Winckel (*Handbuch der frauen krank*), who found two mucous polypi, the largest the size of a pea, in the bladder of a child who died thirty-six hours after birth. One of the few cases where a myxoma developed in an adult is described by Thomson (*Brit. Med. Jour.*, 12, 3, 81). Here the patient was forty-one years of age. In some cases partial attempts have been made by ligature or scissors to remove fibro-myxomas, but they have speedily increased in size again. It cannot be argued from this that the growths were malignant, as the removal was evidently very incomplete, and in no case is there any suggestion of the bladder tumour involving other tissue or giving rise to secondary growths elsewhere. The young cell growth especially noticeable near the surface is partly inflammatory and partly an indication of peripheral growth.

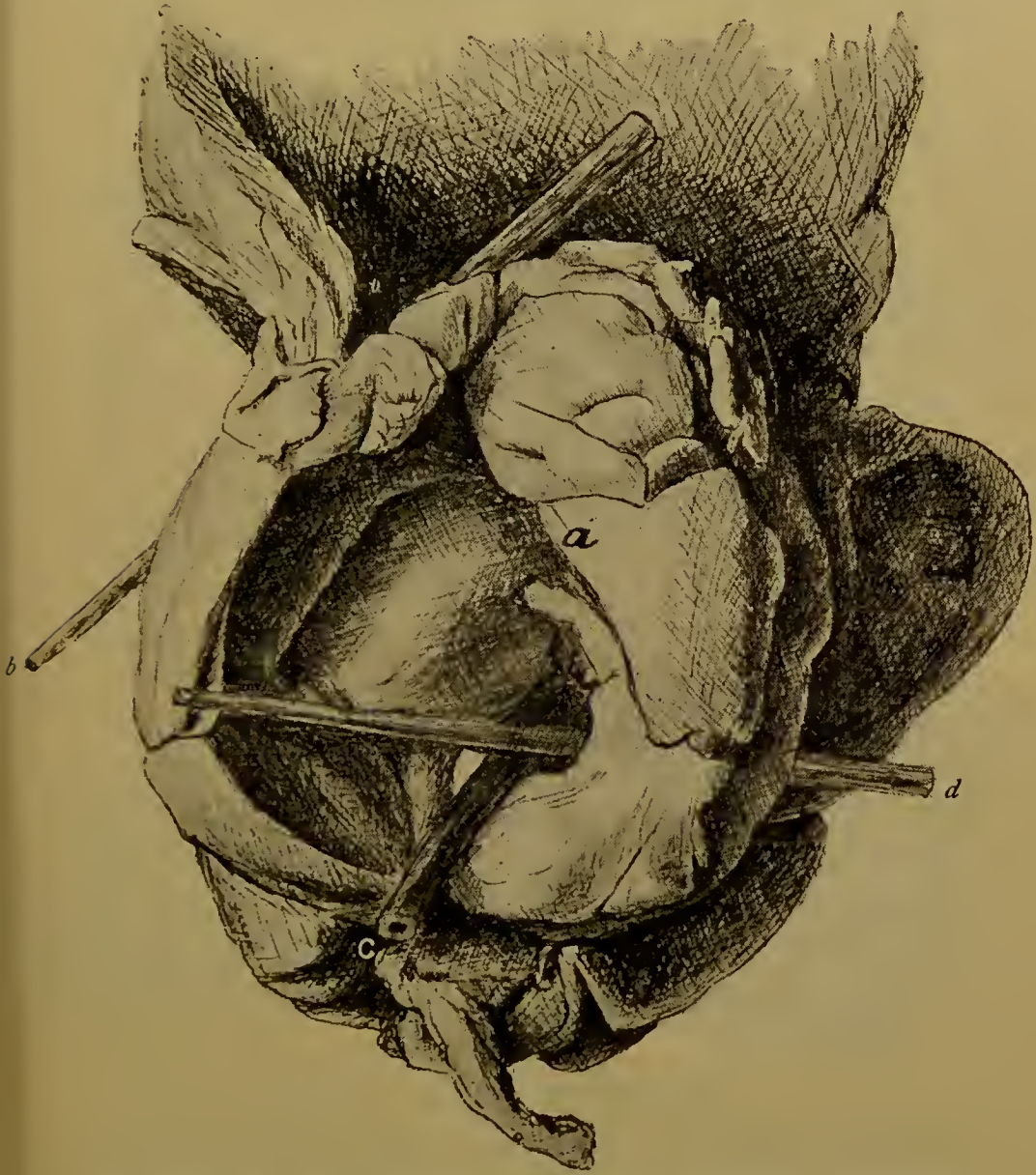
MYOMA AND FIBRO-MYOMA.

Pure myoma is of very rare occurrence in the bladder, in fact beyond Volkmann's case (*Arch Chir. Clin.*, Bd. 19), two quoted by Chiarri and Belfield and one by Lawson Tait, none are to be found recorded, unless it be one of Thompson's, No. 14 in his table of operations.

The first mentioned measured 8 cm. by 6 cm., and was attached by a pedicle to the vertex. Tait's was also pedunculated, but grew from the base, whilst the other three were either sessile or were imbedded in the bladder wall at the base. It is worthy of notice, however, that in one case of Chiarri and Belfield's the tumour though imbedded was enucleable.

Fibro-myxoma is somewhat more common, as about a dozen

such growths are to be found described. An excellent example of fibro-myoma is in Queen's College, Birmingham, see drawing (No. III.) and microscopic drawings (Nos. ii. and iii.). The bulk

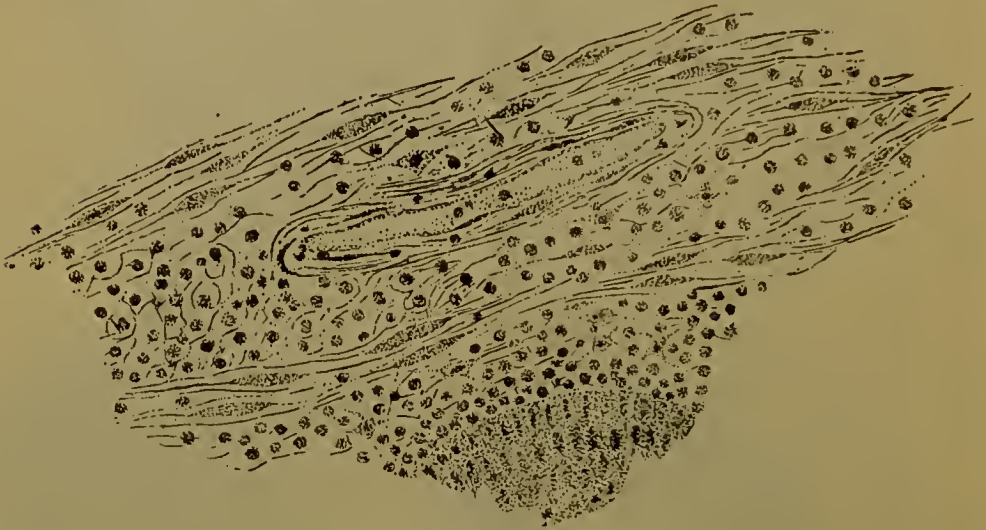


Drawing No. III.—Fibro-Myoma in Queen's College Museum, Birmingham.

a Is placed close to the base of tumour, which is much less than the bulk of the growth. *b* Through ureter. *c* Marks catheter in the lateral cystotomy wound. *d* Passed under part of tumour which protruded into wound.

of this tumour consists of intersecting bands of ordinary connective tissue and involuntary muscular fibre supplied with numerous blood vessels in which the walls are well developed

and have a good muscular coat. The surface layers are however different, being crowded with cell growth of very diverse shapes but of connective tissue origin, and the blood vessels, which are extremely numerous, have less formed walls. Epithelium covers the tumour like that existing on the healthy mucous membrane.



Microscopic Drawing No. ii.



Microscopic Drawing No. iii.

Specimen 3699 in the Coll. Surg. Museum is a fibro-myoma, the surface of which is ulcerated and covered by phosphates. Sections examined by me shew decussating bundles of fibrous tissue, and involuntary muscular fibre with here and there a little fat, and towards the free surface, where the vascular distribution is most luxurious, a great amount of cellular growth of varying shapes. What is the nature of this cellular growth? Is it evidence of sarcomatous change, or of peripheral extension

or of inflammatory change? Probably of the last two, certainly much of it is inflammatory. for the small-celled infiltration round many of the vessels is remarkable, and from this all stages of fibro-blastic development can be traced, the irregularity both in shape and size of the cells forbidding the idea that they are sarcomatous elements.

An example of a fibro-myoma from comparative pathology is specimen 3705 in the Coll. Surg. Museum. This is an enormous growth nearly filling the bladder of an ox, and appearing to be inseparably connected with its coats, principally of the anterior wall. The naked eye appearance of the sectioned surface shews the mixed tissue of which it is composed, although from the description the differences seem to have been even more marked in the fresh state of the specimen. Whilst however the immense bulk of this tumour is made up of fibrous and muscular tissues, near the surface there is a good deal of cellular infiltration, and some doubtful in-growth of epithelium.

From which part of the muscular coat these tumours arise is often uncertain, but in the Queen's College specimen it appears to have been the internal longitudinal layer, for part of the growth can be stripped off leaving the transverse fibres intact. The attachment is rarely by a narrow pedicle; indeed in only one case is such a condition mentioned. Usually the growth is sessile and imbedded, or attached by a wide base; but reference to drawing (No. III.) shews some attempt at pedunculation, for although the base is wide, yet there is a considerable expansion in the bulk of the tumour.

The site is usually at the base of the bladder, though not so commonly so as in the other innocent tumours. In two specimens mentioned as existing in the College of Surgeons, one is from the anterior and the other from the right lateral wall. Further, the development of the tumour may be towards the external rather than towards the internal surface of the bladder, as was found in a case of Fayes' (Schmidt's *Jahrbücher*, 1872), where a huge fibro-myoma as large as a man's head grew from the bladder coats into the pelvis, and proved a great obstacle to

the delivery of the patient, who was pregnant. This enormous size is exceptional, the size generally varying from that of a hen's egg to that of a nut.

The tumours are firm and tough on section, and have a more or less lobulated or fissured surface, though rarely does this extend so deeply as to produce multiple growths, and occasionally the solid part is covered with papillæ. Such a condition existed in Case 16 of Thompson's table, and serves to connect the fibro-myomas with the more solid forms of fibro-papilloma, the base of which contains a good deal of involuntary muscular fibre. Both sexes are affected and in about equal numbers, whilst the age may vary from infancy—two years being the youngest—to somewhat beyond the middle period of life.

Here, again, the question may be raised as to the innocent characters of fibro-myomas, just as it was in the other classes of tumours already described. The suspicion arises no doubt from the recurrence after removal, such as happened in Thompson's case No. 16, and in one published by Schatz (*Arch. f. Gynaekol.*, 1876). This latter recurred twice, and was eventually completely excised with a good result. But it has already been pointed out that recurrence after incomplete removal is not sufficient to condemn a growth as malignant, in the absence of local invasion of tissues and of secondary growths. The microscopical characters of these tumours and their significance have already been commented upon.

It is here convenient to study the relationship of a class of tumours named by Sir Henry Thompson "transitional," and regarded by him as being intermediate between papilloma and sarcoma. Referring to the table at the end of his book, "Tumours of the Bladder" (1884), Cases 3, 12, 14, 16, 19 seem fair instances of such growths; all have much the same general characters, being of firm consistence, broad based or sessile, somewhat lobulated on the surface, intimately connected with the coats of the bladder and projecting prominently into its cavity.

The microscopic characters of Case 3 are described by Boyd

in the *Med. Chir. Trans.*, Vol. 66. Briefly they are—"Fibrous tissue with some dense bands intersecting it; cells everywhere numerous, and in some places forming a dense infiltration. The blood vessels have distinct walls of their own; that is, they are not formed by the elements of the tumour; the surface is covered in places by epithelium; probably a loose fibroma." In the same volume may be found a report by Gibbs on Case 12, founded on examination of superficial parts of the growth. "The muscle appears normal, and there are dense bands of fibrous tissue of sodden appearance; the blood vessels in the deep parts have very thick walls, and are surrounded in places by small cells; there are collections of round cells like lymphoid cells in places, and these are arranged in round or oval masses; the epithelium on the surface resembles that of the normal bladder in every respect." The reports on Cases 14, 16, and 19 appear to be quite similar, so that it is unnecessary to give details of them.

The suspicion of sarcoma in all the cases is excited by the presence, amount, and character of the cellular infiltration; but I think a better explanation is that these all may be accounted for by the inflammatory theory, for in each instance cystitis, with its accompanying frequent and powerful contractions of the bladder, existed, the tumours being constantly exposed to irritation. Thus is explained the infiltration mentioned around the vessels and the collection of lymphoid cells in patches, which of itself is very characteristic of inflammatory conditions. The attempted development of these cells into fibrous tissue through the various stages of fibro-blasts would produce cells of very diverse shapes, such as are described and depicted in Thompson's book, whilst the author's examination of several sarcomas leads him to conclude that the cells of any particular sarcoma are generally pretty regular in size and shape. The walls of the blood vessels, well developed and distinct from the tissues of the growth, are also characteristic of innocent formations. The further history of these cases after operation also affords evidence worthy of notice; in Cases 12, 14, and 16

only is it available. In the first, a report about a year later states that the growth was not much increased; in the second, nine months later there was evidence of more rapid development; whilst the last patient was alive four years later. Although there is no doubt his tumour had augmented, yet this is hardly consistent with the original growth being nearly allied to sarcoma. It seems therefore likely that these growths are either inflamed fibromas or fibro-myomas.

There remains now for discussion a few unusual innocent growths.

Kaltenbach, in the *Arch. f. klin. Chir.*, 1884, published a case of what he calls papillary adenoma, which in its general character appeared very like to papilloma. He regarded it as having its origin in some of the mucous follicles, and describes it as consisting of numerous branching processes clothed with a single layer of long cylindrical epithelium, the whole being furnished with a large number of blood vessels with a moderate amount of small-celled infiltration around them.

Dermoid tumours occur on rare occasions. One observed by Bryant (Coll. Surg. Mus., 3707, B.), and another by Blicke and Winge (*Schmidt's Jahrbücher*, 1871) are undoubted instances, whilst in St. Bartholomew's Hospital Museum is a specimen, No. 2436, of a dermoid tumour in the bladder of a pig. Of others it appears probable that they did not originate in the bladder but simply made their way through its walls, being originally connected with parts outside it.

In both the cases above referred to the tumours were attached by pedicles, and consisted of skin with its sebaceous and sudoriparous glands, hairs, and in Blicke and Winge's case, bone and cartilage. Bryant's tumour was successfully removed but the other existed nineteen years, and eventually wore the patient out. At the *post mortem* the following interesting condition was found:—Evidence of severe cystitis all over the bladder, and on the posterior wall a tumour the size of a walnut, partly covered by long fine hairs, and having the other constituents already alluded to. The pedicle could be traced through the wall into

a process connected with the right ovary, from which by some original error in the development of the bladder no doubt the dermoid structures grew.

The specimen in St. Bartholomew's Museum contains crystalline matter, fat, bristles, and a small hoof, which are said to have almost completely filled the bladder originally, but it is impossible now to say how the growth was connected to the bladder walls.

Another rare kind of tumour is one described by Langhams (*Virch. Arch.*, 1879) as a cavernous angioma. It occurred in a male, aged nineteen, who had suffered from hæmaturia for ten years, and who eventually died of it. At the *post mortem* several patches of true cavernous tissue were found in the mucous and sub-mucous coats, the cavernous spaces were lined with a regular endothelium, and no capillaries could be made out. A few thrombi were found in some of the patches.

On the authority of Ordonez (*Gaz. Méd. de Paris*, 1856), enchondroma must be recognised as one of the tumours to be found in the bladder; but his appears to be the only case in existence, unless it be specimen No. 3702 in the Coll. Surg. Mus., though perhaps chondro-sarcoma would be a more correct designation for the latter. In Ordonez's case the walls of the bladder were a good deal thickened, and in section presented a greyish white semi-transparent surface, whilst the cavity of the organ was almost filled with a brownish yellow transparent material like gelatine. Microscopic examination of the bladder walls shewed a fibrous matrix with cavities containing cartilage cells, and these last were found in the gelatinous material filling the cavity. It appears as though the tumour had undergone mucoid degeneration.

Hydatids occasionally occur in connection with the bladder, though some described as such are doubtful, and might be more correctly described as near the bladder. A case published by Ainsworth (*New York Med. Rec.*, 1880) is a genuine example apparently of hydatids in the cavity of the bladder, though there is no mention of the exact connection with the coats of

the viscus. Lying free in the cavity were about sixty cysts, from the size of a pin's head to that of an orange, and there were in addition two ruptured mother cysts. The right lung and the spleen were also affected.

Habershon (*Path. Soc. Trans.*, v. 2) and Fenwick (*Path. Soc. Trans.*, v. 36) each describe a case in which a large hydatid cyst developed in connection with the external coats of the bladder and extended into the pelvis, compressing the bladder itself but not communicating with its cavity.

SECONDARY AND ASSOCIATED LESIONS OF THE BLADDER AND UPPER URINARY PASSAGES.

These lesions are so frequent and have so great an influence upon the patients' futures as to render their study a matter of great importance. The effect of tumours in the bladder upon the organ itself is almost invariably to cause hypertrophy, which frequently exists to a degree sufficient to produce some, or it may be a good deal of, fasciculation, this hypertrophy resulting directly in some cases from the tumour plugging the internal orifice of the urethra, in others from the frequent and powerful efforts at micturition due to the mere presence of the growth, or from the cystitis caused by its existence. In those cases where cystitis has supervened upon the formation of a tumour, that is especially in the carcinomas, the mucous membrane is found thickened and sodden and of a purplish grey colour, with superficial ulcerations when the cystitis has been unusually severe. Occasionally phosphatic particles are deposited on various parts.

Sacculation of the bladder is sometimes found, but it does not always bear the same interpretation. No doubt in some instances the hypertrophy is caused by the presence of a tumour, in others it is produced by some pre-existing lesion, such as enlarged prostate (see a specimen of myo-sarcoma in the Coll. Surg. Museum). In at least three cases the

sacculus was the seat of the growth, in one a sarcoma, in another a carcinoma, and in the third a fibroma. In one case, an alveolar sarcoma, the obstruction produced by the tumour caused dilatation of the urachus, and an abscess which pointed at the umbilicus (specimen No. 2,419 St. Bartholomew's Museum). A very similar condition appears to have existed in a case of fibroma under the care of Gersuny.

The destruction and perforation of the bladder walls by malignant tumour has already been alluded to *loco cit.* under the several descriptions of those growths. It is however in the ureters and kidneys that the gravest changes are found. These changes are found in some variety, but for our purpose they may be grouped into two classes, those of hydro-nephrosis and those of pyo-nephrosis. In the case of hydro-nephrosis the ureters are dilated, often to an extreme degree, so as occasionally to resemble pieces of small intestine rather than the parts they represent. The pelves of the kidneys also share in this dilation, and there is corresponding atrophy of the pyramids, or it may be even of the cortices, until the organs are reduced to mere bags of fluid, though it rarely proceeds as far as this. With these dilative changes there is associated a chronic or it may be a sub-acute interstitial nephritis. In the cases of pyo-nephrosis all the above changes are found, but the enlarged parts are found to contain pus instead of clear urine, and the kidney may be reduced to an abscess sac. At the same time, in those parts of the kidney still left, acute interstitial nephritis is found often, and in many this has advanced to a state of suppurative nephritis or "surgical kidney." Both sides are not necessarily affected in the same patient nor to the same degree; one kidney may be almost destroyed and the other left practically healthy. Further, hydro-nephrosis may be found on one side and pyo-nephrosis on the other.

As will be seen in the following tables, all kinds of tumours produce these destructive effects, and in about the same proportion.

Kind of Tumour.	No. of complete P.M.	Hydro- nephrosis.	Pyo- nephrosis.
Papilloma	33	16	12
Myoma, Fibro-myoma ...	8	3	1
Fibroma and Fibro-myxoma	10	2	4
Sarcoma	18	8	4
Carcinoma	49	20	13
	<hr/> 118	<hr/> 49	<hr/> 34

It is necessary to point out that these statistics are derived partly from cases dying without operation and partly from those who died after operation, but all have been rejected where no certain information was obtainable about the condition of the kidneys and ureters

Pyo-nephrosis may in this table be somewhat exaggerated in frequency, as it is likely that the suppurative process was occasionally produced by operation, that is, it supervened on what was before only hydro-nephrosis.

It will be seen that hydro-nephrosis and pyo-nephrosis existed in about 70 per cent. of the cases submitted to a complete *post mortem*, but the percentage is somewhat higher in the innocent than in the malignant tumours. This would at first sight appear somewhat anomalous, considering the bulk and the wide area of the bladder affected by the latter; the explanation no doubt lies in the much more prolonged course of the innocent growths during which they slowly but constantly produce their effects.

The difficulty of deciding whether the kidneys have suffered is necessarily the same here as in stricture, etc., but it is important to remember what a length of time some innocent tumours may exist without producing any dilatative change; for instance, Treves relates a case where symptoms had existed for thirteen years, and Pousson one for fourteen years, in both patients the kidneys being found healthy at the *post mortem*.

This dilatation of the upper urinary passages is produced in one of two ways, either by the orifices of the ureters being directly involved in the growth, or by the obstruction produced by the thickened muscular and mucous coats.

Not a few of the innocent tumours are attached near to the openings of the ureters, and although they do not directly overgrow them, yet by the position they assume, and by dragging on their attachment they act as obstructions to the free escape of urine. Occasionally the ureteric orifice may be quite occluded by a tumour, generally a malignant one.

Rarely, calculus in the kidney accompanies a tumour in the bladder, but the association is probably an accidental one. It has been suggested that renal calculus may have some influence on the production of carcinoma of the bladder, as calculus in the gall bladder has been surmised to have on the formation of carcinoma of the liver, but even if the latter supposition be true, the analogy is a false one, for the conditions are reversed here, the stone being in the secreting organ and not in its reservoir.

This leads up to the question of etiology on which there is not much that is definite or certain to be said. The most important factor in the production of almost all forms of bladder tumour is age. Setting aside those rare growths, the fibromyxomas of childhood, the large majority of all others develop between the fortieth and seventieth year. Remembering then the special liability of the male sex to growths in the bladder, and the frequency with which that sex is affected by stricture, enlarged prostate, cystitis, and stone, during the period above mentioned, the importance of continued irritation of the bladder walls as a factor in the production of vesical tumours is obvious.

When an attempt is made however to define a sufficient cause in each individual case, it generally results in failure. In less than 5 per cent. of all the patients suffering from vesical tumour did calculus co-exist, apart from such as were probably produced secondarily. Occasionally mention is made of the passage of gravel, but of what nature there is nothing to shew.

Again, stricture occurred even less often than stone as a complication, but enlarged prostate was more frequently present, judging from museum specimens.

The constant impinging of a catheter on a particular part of

the mucous membrane of the bladder appears to have produced an epithelioma in one case described by Hilton Fagge (*Path. Soc. Trans.*, Vol. 28). A similar cause may have been at work in at least one other instance, but in no more.

The fibro-myxoma of infancy may be regarded as favouring Cohnheim's theory of the development of a growth from "embryonic remains."

TUMOURS OF THE BLADDER.

SYMPTOMS, PHYSICAL SIGNS, AND DIAGNOSIS.

Hæmaturia.—This is of all symptoms the most important, in fact the others are dwarfed by it almost into insignificance. It is not however the mere existence of hæmaturia in vesical growths which is of such great diagnostic value as the manner in which it occurs, its amount and frequency. How constantly this symptom is present may be gathered from the following table.

<i>Kind of Tumour.</i>	<i>No. of Cases.</i>	<i>No. suffering Hæmaturia.</i>	<i>No. in which Hæmaturia was the first symptom.</i>
Papilloma	76	73	62
Other Innocent Tumours	39	21	9
Sarcoma	22	13	11
Carcinoma	64	55	47
	<hr/> 201	<hr/> 162	<hr/> 129

The Papillomas are almost invariably accompanied by hæmorrhage, and usually this is the first and sometimes the only evidence of their présence. The exposure of the delicate papillæ to laceration by contraction of the bladder walls, or the engorgement and rupture of the vessels by some accidental interference with the return of the venous blood, is a very patent cause of this constant symptom. The remaining innocent tumours do not so frequently give rise to bleeding, owing to the absence in most of fine papillary processes on the surface, but the thin-walled vessels in the superficial layers are easily

burst by some slight engorgement of the tumour, and in others, as in Volkmann's myoma, the blood vessels are opened by ulceration, a condition which here, as in uterine myoma, may give rise to the most severe hæmorrhage.

With regard to the malignant tumours, some doubt appears to have existed as to the common occurrence of hæmorrhage in these at an early period of their existence and before other symptoms have declared themselves.

Sir H. Thompson says, "Carcinoma and Sarcoma do not usually produce considerable hæmorrhage until the disease has reached a somewhat advanced stage. A painless hæmorrhage is very rarely if ever the earliest sign. The bleeding is almost invariably preceded, and sometimes for a considerable time, by signs of obstruction, by pain or irritation of the bladder." Opposed to this is the experience of the French school and of other English surgeons, whilst Stein appears to agree in the main with Thompson.

Reference to the table above, shews that 68 patients suffered from hæmaturia out of 86 who were the subjects of sarcoma and carcinoma, and in 58 of these, hæmorrhage was the first symptom mentioned. From this it will be gathered that though hæmaturia commonly occurs in malignant tumours, and in the majority of cases as the first symptom noticeable, yet in both respects patients with papilloma suffer in a much higher degree. Whilst, however, papilloma gives rise to bleeding, which is at first, and often for long afterwards, unassociated with pain or difficulty in emptying the bladder, both these troubles speedily arise in the malignant growths in a majority of cases. The source of the hæmorrhage in sarcoma and carcinoma is either the papillary surface found on a considerable number of each, or destruction of the growth by ulceration.

Leaving now the frequency of the hæmaturia, we come to its general characters, one of the most noticeable of which is intermittence. At first it appears as a transitory and generally as a very mild attack, without cause, without pain, and it disappears as suddenly as it came, perhaps existing only during one or two micturitions; after a time the incident is almost forgotten, when,

it may be some weeks or months later, another attack supervenes of greater severity and longer duration. Again, there is cessation, with future recurrences; the intervals between which as a rule become shorter and shorter, whilst the duration of the hæmorrhages becomes more and more prolonged. Even then, the character of the hæmorrhage is most capricious, to-day severe, to-morrow slight, and the urine which in the early morning is as dark as blood itself, may in the afternoon be only just tinged with colour. After the course above depicted has existed for months, or years more commonly, the bleeding may become almost continuous for weeks together, but by this time other symptoms will have been added and that early, if the tumour be malignant.

The intervals between the attacks allow of recuperation, or else the lives of many patients would be cut short by the immediate effect of the hæmorrhage; as it is, fainting may be induced if the sufferer get out of bed during a severe bleeding, and in a few cases death has resulted directly from a severe and long continued loss.

As has already been mentioned, the amount of blood mixed with the urine is very variable, but when the bleeding is in its severest form it is only equalled by that which occurs in malignant growth of the kidney or by the loss, such as I have twice observed in hæmo-philic patients.

If the vessel into which the patient has made one or more micturations be examined, the blood and urine appear pretty well mixed together, but if the act of micturition be watched the proportion of blood will often be noticed to increase greatly towards the end of the act, indeed in the early days of the tumour, it is only at this time that a few drops of blood are expelled and the patient may notice a stain of blood on his linen before he observes any alteration in his urine. In the severe attacks a considerable amount of clot is often expelled from the bladder, or it may be formed in such quantity that the organ is unable to void it.

Arising without cause and disappearing as suddenly and without obvious reason for its cessation, the hæmaturia is but little

influenced by the circumstances under which the patient exists ; movement does not as a rule increase it nor does rest, even in bed, diminish it. Occasionally severe exertion or fatigue from long travelling seems to precipitate an attack, but patients who are free from pain and other difficulties often continue at their work, finding their condition apparently not aggravated thereby. The amount of hæmorrhage is not in any way an indication of the size of the tumour from which it comes, for it may be extremely profuse when the growth is not larger than a filbert, whilst it may be slight when the neo-plasm is of considerable size ; lastly, it is most important to remember that not a few cases, nearly one-fifth of all kinds, run their course without hæmaturia occurring at any time, so that the absence of this symptom does not of itself exclude vesical tumour from the diagnosis.

Pain and frequent micturition next demand consideration, and they are so commonly associated and dependent upon the same cause as to make it difficult to separate them. Often they are merely symptoms of the cystitis which complicates many bladder tumours, arising late if at all in the course of the papillomas, earlier and more frequently in the firmer innocent growths, and almost as commonly in the malignant. Cystitis is perhaps more frequently set up in the late stages of papilloma than is generally believed, for it is recorded in 17 cases out of 76. In the malignant growths it attains a higher rate and is of greater severity ; the urine becoming loaded with pus, mucus and phosphates and of the most intensely foetid character, like decomposing fish. Often death is due to this complication rather than to hæmorrhage or the general effects of malignant growth. When cystitis is present the pain varies in its intensity from mere discomfort up to the most extreme agony, it is felt in that common situation the glans penis, in the perinæum and above the pubes. Frequency of micturition too is equally variable, in the early days only breaking the patient's rest two or three times in the night, it gradually increases in frequency to every hour, or even to every few minutes, until what with pain and repeated empty

ings of the bladder the patient's life becomes a positive burden to him.

Apart altogether from cystitis, pain and increased frequency both exist however. Even in papilloma dull aching pain may be felt above the pubes or in the perinæum, and if clot forms in the bladder, pain along the urethra will be complained of when the clot is evacuated ; but it is in the malignant growths that pain as a symptom is of the highest value, especially when it exists by itself or at all events is not the result of micturition by an inflamed bladder. Under these circumstances, severe lancinating pain, especially if continuous for some time and radiating into adjacent parts such as the thighs and buttocks, is very suggestive of the presence of a malignant growth. Whilst pain however may be evidence of cystitis, or an indication of the presence of a malignant growth, its absence must not be regarded as certain evidence that a tumour is innocent in its character, for some remarkable cases are recorded of malignant formations attaining a great size, during the whole course of which pain was not complained of.

Before leaving the subject of pain, attention must be directed to its presence in the region of the kidneys when hydro-nephrosis or more commonly when pyo-nephrosis exists ; the pain is generally of a dull aching character, and is of importance mainly because it may exist when the bladder is free from pain, and in the presence of hæmaturia the kidneys may be suspected as the seat of the lesion. Increased frequency, when not dependent on cystitis, may be due either to the presence of blood in the bladder (and then subsides with the hæmaturia) or to the simple presence of a foreign body in the cavity, especially if the growth be of large size, or even when small, if it involve the parts about the neck. Again, many pedunculated growths may cause irritation by impinging upon or entering the internal orifice of the urethra.

When hæmaturia is not the earliest symptom, frequent micturition and pain, either separately or together, may first attract attention ; the following table shews with what frequency.

<i>Kind of Tumours.</i>	<i>No of Cases.</i>	<i>Frequent mict. and pain the earliest symptom.</i>
Papilloma	76	10
Other Innocent Growths	39	18
Sarcoma	22	7
Carcinoma	64	12
	<hr/> 201	<hr/> 47

Here it will be seen that these two symptoms, more commonly than hæmorrhage, indicate in the first instance the existence of the firmer innocent growths such as fibro-myoma, or of fibro-myxoma. In the sarcomas also they are often earliest noticed, whilst in the carcinomas and papillomas they do not give such early evidence of the presence of the tumour.

On rare occasions retention or incontinence of urine is the first symptom complained of, but commonly they appear secondarily to hæmorrhage or pain. Retention occurs in all kinds of tumours, but usually in those that are pedunculated, owing to the tumour or part of it becoming impacted in the commencement of the urethra, but the formation of clot in the bladder is sometimes the cause of this accident. The retention does not persist as a rule so as to demand the constant use of the catheter, but once relieved may never recur or only after some lapse of time.

The *incontinence* really comprises two conditions, true incontinence and overflow of urine from retention. The former occurs in some malignant growths and is due to the cavity of the bladder being filled by a large tumour mass, or to its walls being rendered so indistensible by the infiltration they have undergone, as to refuse to expand under the slight pressure of the urine, which consequently trickles away as it is secreted. Difficult micturition, in which the patient has to strain much to evacuate his urine, is mentioned as the first symptom attracting attention in about half a dozen cases, but it is more often spoken of as secondary to other symptoms

Sudden cessation of the flow of the urine in the middle of micturition, such as occurs in vesical calculus, happens in a few patients with tumour, and in the absence of stone, as shewn by

sounding, this symptom would be of considerable value as it would indicate the presence of a tumour and its probable attachment by a pedicle.

A curious condition was described by Ultzmann, in 1878 (*Ueber Hematurie*), and was regarded at that time as characteristic of "villous" tumour.

The following observation was made in three cases : the urine when passed was very fluid and of a pale yellowish-red colour, evidently containing little blood, it coagulated rapidly into a soft sticky mass, which adhered to the sides of the vessel, and which was quite disproportionate in size to any clot that could have been formed by the blood present and differed from blood clot by the fact of its being rendered fluid by shaking. Ultzmann explains the phenomenon as follows :—the powerful contractions of the bladder in micturition give rise to engorgement of the vessels of a tumour by preventing free venous return, this may lead to rupture and hæmorrhage, or if the tension be less, to escape of the plasma of the blood, which mixing with the urine coagulates when voided. The same explanation probably holds good in those cases where the urine contains much more albumen than the blood or pus present will account for.

Fibrinuria was observed by Stein in a patient] suffering from "villous cancer," and a coagulation much resembling it was noted by Neale in a patient with "adeno-encephaloid cancer,"* although here there was more blood. If any conclusion can be drawn from the presence of fibrinuria it is simply that the surface of the tumour is papillary or villous, but it does not follow that the growth is a papilloma.

Attention will now be directed to the detection of fragments of growth passed with the urine, and to another valuable indication of the presence of tumour in the female sex, viz. : protrusion of part of the growth at the meatus.

In the 201 cases of which the histories are recorded with accuracy, fragments were found twenty-nine times, and they were

* *Brit. Med. Jour.*, 1887.

distributed as follows :—In papilloma, 15 times in 76 cases ; in fibroma and fibro-myxoma, once in 20 cases ; in myoma and fibro-myoma, twice in 15 cases ; in dermoid, twice in 2 cases ; in sarcoma, once in 22 cases ; in carcinoma, 8 times in 64 cases.

Generally the nature of the fragments coincided with the bulk of the tumour from which they were detached, but this was not always so, and in four of the carcinomatous cases at least, the shreds of tissue afforded no evidence of the malignant nature of the tumour, a fact to be borne in mind when giving a diagnosis or prognosis in any particular case. The fragments passed in the case of fibro-myxoma and in Volkmann's myoma enabled a positive diagnosis of the nature of each tumour to be made and in both of the dermoids, hair was passed in some quantity. As a rule the particles detached are of very small size, but they may be sufficiently large to cause great pain as they are forced along the urethra, in which they may possibly become impacted, and it is advisable to question patients on this point as they occasionally remember to have passed bits of "flesh" or "gristle." In the *Edin. Med. Jour.*, 1864, Sanders mentions a case of epithelioma in which shreds of growth, some so large as to be impacted in the urethra, were frequently passed, but the patient never suffered from hæmaturia ; this appears, however, to be the only instance of such an anomaly on record. The search for fragments should be carefully made, especially in the deposit at the bottom of the vessel into which the urine is passed, and clots of any size should be broken up by the finger lest they conceal any particles of tumour ; should nothing be found the first time, the search should be repeated several times before it is relinquished, as in one of my own cases at least a dozen examinations were made before a fragment was met with. In a few rare instances piece after piece of the tumour has been passed, until, judging from the subsidence of symptoms, a spontaneous cure has resulted.

In using the catheter to relieve retention or for some other purpose the presence of a growth has been accidentally discovered by a fragment catching in the eye of the instrument and

being torn away, sometimes with permanent relief to symptoms. Sir Henry Thompson has suggested the use of a small lithotrite to obtain evidence by bringing away fragments in its jaws, or, what appears to be a better method to elicit this positive evidence, he advises that the bladder should be carefully washed out by means of a small evacuating catheter and the aspirator used in litholapaxy; this plan of washing rarely fails in his hand to give evidence of fimbriate papilloma when it exists, but the cystoscope has done away with the necessity for such a procedure.

Any fragments found should of course be submitted to microscopic examination, not only to determine their exact structure, but also to make certain that the tissue really is part of a tumour and not a foreign body accidentally mixed with the urine. Some of the particles will be altered by necrotic changes and the epithelium will be partly shed, but even then sufficient of the papillary or other structure will be left for recognition under a moderately low power, such as a No. 4 Hartnack.

A word of caution is necessary as to the recognition of loose cells in the urine as "Cancer cells." The epithelium shed from the urinary passages is most diverse in shapes; it may come from the tubules of the kidney, the pelvis, the ureter, the bladder, or urethra; it may be squamous, columnar, spheroidal, or tailed; and if squamous more than one nucleus may be seen in the same cell; further, several cells may be aggregated so as to form a patch. If then any diagnosis of malignant disease is made from these loose elements it is almost certain to be wrong, but the error is not likely to be made by anyone who has been in the habit of examining urinary deposits, as such an one will be familiar with these varying cell forms.

Protrusion of the tumour at the meatus can occur of course only in females, and is the only absolutely certain evidence of the presence of a growth in the bladder; unfortunately it is a rare event, happening only eight times in forty-nine female patients, and contrary to what might have been anticipated the firm broadly-pedunculated tumours are more liable to this acci-

dent than the papillomas. Three were fibro-myxomas in children, two were fibromas, two fibro-myomas, and one was a spindle-cell sarcoma. The growth may be extruded during the effort of micturition and then recede, or it may remain permanently in the urethra, and if the surface be cut off a further expulsion may occur. The portion in the urethra and external to it becomes partially strangulated, and cystitis is almost certain to arise if it does not already exist, but the urine generally trickles away by the side of the projecting portion, and retention does not occur. The urethra may undergo enormous dilatation, in fact, in one case it was at first mistaken for the vagina, and in a patient of Godson's the dragging of the tumour had partially inverted the bladder through the canal.

Stein quotes a case recorded by Brennecke in the *Arch. f. Gynækol.*, 1879, which I have not been able to find, but the record is so unique as to justify mention:—A woman at about the sixth month of her pregnancy suffered from intense vesical catarrh and occasionally with sudden stoppage in the evacuation of urine. She was then seized with violent bearing down pains lasting several hours, and finally expelled a fibro-myxoma as large as the kidney of a new-born child, and remained perfectly well afterwards.

PHYSICAL EXAMINATION WITH THE SOUND AND PALPATION
ABOVE THE PUBES AND BY THE RECTUM OR VAGINA
ACCORDING TO SEX.

The use of the sound gives either positive or negative evidence, each having its own value, although there has been some tendency to depreciate the indications given by this instrument because they are generally of a negative kind. It must however, be borne in mind, that in some of the more obscure cases the surgeon needs all the means at his disposal to enable him to arrive at a correct conclusion, and in such cases the first step is to exclude the presence of calculus which will be only settled by the sound, whether it give any further information or not. Prejudice has been excited against the use of this instrument by

the reports of cases in which severe hæmaturia or cystitis has been produced by sounding, and though it is indubitable that death has been hastened thus, yet this calls for great care in the performance of the manipulations rather than for their exclusion altogether. The sound to be used should have the ordinary short beak, and it is best to have at hand if necessary, Thompson's instrument, for the convenience of injecting fluid into the bladder if it be empty and doubt exist whether the sound is impeded by the vesical walls or by growth.

The purposes for which sounding is resorted to are various ; to decide the presence or absence of calculus in those cases where hæmaturia is slight or absent altogether, and the symptoms of "irritable bladder" predominate ; to recognise a tumour if it be of such consistence as to allow of this ; to determine to some extent its site, size and attachment, and lastly, to assist the finger in the rectum or vagina in determining whether any thickening exist about the base of the bladder, when this is not very obvious to external examination alone.

The recognition of papilloma by the use of the sound is rare and uncertain, the sensation imparted to the examiner being described as a "softish feel" or some slight "irregularity," but there is nothing more definite than might be imparted by the muscular fasciculi of a hypertrophied bladder.

The presence of the more solid tumours is recognisable in a greater degree, but even amongst the carcinomas the proportion detected by the sound is not so great as might be anticipated, certainly in nothing like half the cases examined. When the sound enters the bladder it may meet with obstruction immediately and after a little manœuvring pass on to find the posterior part of the cavity free, or it may be deflected entirely to one side of the organ by the prominence of the other, or it may detect only roughness of the surface over a limited area ; such indications as these will give some idea, though not always a correct one, as to the site of attachment. By careful measuring, either with the finger or with Thompson's index on his sound, as in the case of calculus, some idea may be gathered of

the size of the growth and possibly of the method of its attachment, whether by pedicle or no. Finally, with the sound in the bladder, the finger in the rectum or vagina is better able to appreciate any thickening that may exist about the base of the organ, than it is when there is nothing opposed immediately to the digit. Considerable hæmaturia arising from careful sounding is to be noted as of importance.

The other method of physical examination, by bi-manual palpation, is of higher value than the use of the sound, as it gives more frequent evidence of the presence of vesical tumour and is practically free from the danger of producing severe hæmaturia or cystitis, although even by this mode of enquiry some bleeding is not uncommonly produced.

Until comparatively recently the bi-manual method of examining has not received the attention it deserves, at least in this country, hence many reports of cases contain no reference to physical examination by double palpation, and only a very cursory one to digital examination through the rectum or vagina alone. For these reasons no accurate idea can be formed of the frequency with which vesical tumours can be palpated, but it may be safely assumed that most of the carcinomas and sarcomas can thus be made out, that many of the firmer innocent tumours can also be recognised and a few of the papillomas, whilst the size of the tumour may at the same time be determined. The method of procedure is as follows :—the patient should be placed in the dorsal decubitus with the pelvis somewhat raised on a pillow, the bladder should be emptied with the catheter, and it is best, though not absolutely necessary to administer an anæsthetic. The left hand should now make firm pressure above the pelvis whilst one or more fingers of the right are introduced into the rectum or vagina, when, unless in patients with deep perinæums and much abdominal fat, a tumour of any size and consistence can hardly escape detection, and a fairly correct notion may be formed as to whether the tumour infiltrates the walls of the bladder after the fashion of the malignant growths, or is merely attached to them ; at the same time some

idea may be formed of the fixity of the bladder to surrounding tissues, and the opportunity should be taken to examine the lumbar and pelvic lymphatic glands. Palpation above the pubes or by the rectum or vagina alone will sometimes give information, but not so commonly as the bi-manual method, nor is the information so precise.

When all the symptoms have been carefully reviewed and the methods of physical examination utilized the diagnosis of tumour will in many cases be quite clear, and in some such a conclusion be arrived at as to whether operative measures are likely to give relief, but in numerous cases the diagnosis will remain either incomplete or uncertain. That being so we have at our disposal a method of investigation which leaves little to be desired, it is the use of the Cystoscope. It is not required in all cases, in some the constant presence of blood in large quantities prevents a successful inspection with the instrument, but outside these limitations it gives most valuable information. It localises the site of attachment and the method, whether by pedicle or broad base ; in a certain proportion of cases it tells also a great deal as to the nature of the growth, whether it is innocent or malignant, and if there be any doubt as to the route by which removal can best be effected the Cystoscope will clear this up. The use of this instrument does away almost entirely with the washing out for fragments suggested by Thompson, and it must be only rarely that an incision into the bladder for exploratory purposes can be called for. In the female also it can take the place of dilatation of the urethra, which is never quite free from the suspicion of occasionally causing incontinence. Its use also does away with the necessity of sounding.

DIFFERENTIAL DIAGNOSIS.

Under favourable conditions, that is when the symptoms and physical signs are well marked, the diagnosis of vesical tumour is clear, but in some cases the symptoms, principally the hæmaturia, are well marked, but the physical signs are wanting ; in others hæmaturia is absent or scanty, and "irritability" of the

bladder is the leading feature, while the physical indications are doubtful. Under these circumstances what diseases are most likely to be confounded with tumour in the bladder? They are several: calculus, cystitis with ulceration, tuberculosis of the bladder, malignant disease of the kidney, renal calculus, nephritis with severe hæmorrhage, and hæmophilic bleeding from the urinary passages.

From stone the diagnosis will depend partly upon the study of the symptoms, partly upon the use of the sound, but occasionally stone and tumour may co-exist, and not rarely a deposit of phosphates occurs on the surface of tumours. The distinguishing features of the two diseases are to be found in the recurrence and severity of hæmaturia in tumour, the bleeding being independent generally of exercise; whilst in stone the hæmaturia is slight, is almost always made worse by movement, and is not specially produced at the end of micturition.

Pain and increased frequency of micturition are present early and fairly constantly with stone, whilst in many tumours they are absent or very secondary in importance, finally, the detection of stone by the use of the sound is conclusive generally, but if the character of the bleeding has been such as to suggest tumour, even though calculous matter be detected, the surgeon should be careful not to exclude growth from his diagnosis, for cases are recorded of tumour as well as stone being discovered when lithotomy was performed.

From cystitis with ulceration, tumour may generally be diagnosed by the definite cause often to be discovered for the origin of the former, by the predominance in it of pain and increased frequency, and by the absence in cystitis of infiltration of the bladder walls as determined by palpation; but difficulty does occasionally arise as in a case under my care some years since. The patient, aged 40, had suffered for months from sharp hæmaturia with cystitis; palpation discovered nothing, and the sound detected patches of calculous matter but no definite stone. Enquiry into the early history shewed clearly that the trouble had arisen when the patient was lying in bed with a fractured femur, when he was unable to empty his bladder.

The history pointed strongly to cystitis, but the bleeding was so severe as to leave room for some doubt which was only set at rest by membranous urethrotomy; this revealed an ulcer two inches in diameter at the base of the bladder, surrounded by warty elevations which microscopic examination shewed to be simply granulation tissue. Drainage of the bladder was followed by complete recovery.

Tuberculosis of the bladder generally gives rise to marked "irritability," which is usually the first and most persistent symptom; the quantity of pus present may be considerable, but blood is present only in traces as a rule; at all events it is rarely seen in such quantity as in the characteristic bleeding of tumours, though this rule is not absolute. The infiltration to be felt at the base of the bladder is sufficient to distinguish between tuberculosis and innocent tumours, although it may raise a suspicion of carcinoma. This may generally be cleared up by observing that tuberculosis of the bladder occurs in young adults while carcinoma is rare at that age; further, there is often evidence of tubercle in other parts of the body.

Three renal conditions may give rise to error in diagnosis; they are, malignant disease of the kidney, renal calculus, and chronic nephritis, when associated, as it is in very rare cases, with severe hæmaturia.

Malignant disease of the kidney causes hæmaturia in about half the patients affected; the bleeding may be most severe, is often intermittent in character, and on rare occasions is the first indication of the tumour.

The blood passing down the ureter may give rise to pain in the region of that structure, or it may irritate the bladder and cause frequent micturition. Comparing these symptoms with those of vesical tumour, it is evident how the surgeon may be misled if he does not use all the diagnostic means at his disposal; it is advisable then to emphasise the facts, that the bleeding from tumour in the bladder is often most marked at the end of micturition, that it can be induced by the use of the sound, that fragments of the tumour may be obtained by washing out the

bladder and that the growth may be palpated. Apart however from symptoms, there is usually one physical condition present in malignant growth of the kidney which at once sets the question of diagnosis at rest, it is the presence of a renal tumour. Roberts on this point says:—"Abdominal tumour is by far the most constant sign of renal cancer and usually the earliest one noticed. Out of 64 cases, there were only three in which a distinct intumescence could not be felt in the site of the kidney or thereabouts, and in these three, there was hæmaturia." The use of the cystoscope will generally prove conclusively that the bleeding does not come from the bladder. It is not necessary to dwell on the signs by which a renal tumour is recognised, but a method suggested by M. Guyon and termed by him renal ballottement is worthy of mention. In this, one hand is placed in the loin and the other over the front of the kidney, a firm brusque pressure by the first drives the kidney forwards against the anterior boundary of the abdomen, and its return gives rise to the sensation of ballottement when the organ is enlarged. Guyon also alludes to the value of symptomatic varicocele as indicating the enlargement of the kidney on the same side. If then the symptoms and physical signs be thoroughly reviewed, especially if an attempt be made to elicit hæmaturia by sounding, the grave error of confounding bladder tumour with cancer of the kidney will pretty certainly be avoided.

Renal calculus can rarely be mistaken for tumour of the bladder, never indeed, unless a rare association of symptoms occurs to mislead, such as unusually free hæmaturia with frequent micturition and an absence of characteristic pain; a combination very unlikely to exist, as free hæmaturia in renal calculus is not only very rare, but when it does happen, is generally accompanied by pain, both bleeding and pain being made worse by movement, contrary to what obtains in vesical growth.

At a meeting of the Clinical Society, Feb. 25, 1887, Mr. Bowlby drew attention to three cases of severe hæmaturia in patients suffering from granular kidney; in one of these the

bleeding was so profuse as to be mistaken for vesical hæmorrhage.

In two of the three, however, there were general indications pointing to the existence of interstitial nephritis; with the assistance of these, and a careful investigation of the bladder itself, sufficient grounds would be obtained for a correct diagnosis.

Bleeding from the urinary passages in hæmophilic patients is not rare, and it may be both persistent and profuse. There is however, usually a history of other hæmorrhages in the patient which will put the surgeon on his guard as to the nature of the case, and will prevent him from falling into the error of diagnosing vesical tumour. Further assistance will also usually be derived from the fact that the hæmorrhage in hæmophilia is persistent, whereas in vesical tumour it is much more likely to be intermittent.

There remains now for consideration the differential diagnosis between the innocent and malignant growths. How often it is possible to distinguish them before operation the record cases do not state, for even in those where a tumour was diagnosed before operation was resorted to, rarely was any positive assertion as to its exact nature hazarded, unless the presence of fragments in urine made the matter appear certain. There can however be no doubt that in a number of cases, probably in the majority, a correct diagnosis may be formulated as between innocent and malignant tumours.

To determine this question several points need consideration. The first is the hæmaturia; by far the commonest symptom of all kinds of vesical growths, often most severe and originating without obvious cause, yet in one kind of tumour it is more characteristic than in any other, viz. : in the papilloma. Here the bleeding is so essentially intermittent in its early stages (months generally intervening between the earlier attacks), is so rarely associated with pain or increased frequency until a long time after the first hæmorrhage, and the tumour so rarely gives any indication of its presence to physical examination, that an accurate diagnosis of papilloma may sometimes be made even

without the aid of that most useful evidence—papillary fragments in the urine, or of the cystoscope. Between the firmer innocent tumours however and the malignant, confusion is much more likely to arise; in both these hæmaturia is not so constant nor so characteristic when present as in the papillomas, and in both symptoms of “irritable” bladder generally arise early. Physical examination, whether by sound or by bi-manual palpation, will usually detect the presence of firm innocent tumours as of malignant.

To distinguish between them great care must be taken to determine whether the coats of the bladder are infiltrated by growth, whether there is nodulation to be made out, whether the bladder walls are fixed to the surrounding tissues and whether the deep lymphatic glands are enlarged; if all or any of these exist, the suspicion, in some cases the certainty of malignancy, will be established; if on the contrary there appears to be no infiltration, and the bladder is not only free from adhesion but its coats can be made to move over the tumour, the presumption of innocence is justified, and this will be strengthened by the cystoscope detecting a more or less pedunculated attachment of the growth. Assistance may be obtained from other factors, as by the presence of fragments of growth in the urine, the protrusion of the tumour at the meatus in women and the age of the patient. With regard to fragments in the urine there is just a word to be said; at times they give positive and reliable information, as for instance in Volkmann’s myoma and in one of the patients suffering from fibro-myxoma, in each of which a mass of some size and of definite histological characters was passed. In other cases simple papillary fragments have been passed when the bulk of the tumour was very different—carcinoma, myoma, etc. It is necessary therefore not to let the presence of papillary fragments so influence the judgment as to override strong evidence obtained by physical examination.

The age of the patient is of considerable importance; if it be less than 40 the presumption is strong against carcinoma, though not quite so strong against sarcoma, but the reverse does not

obtain ; that is, the fact of the patient being over 40 is not sufficient to condemn him as suffering from a malignant growth, for it has already been pointed out that papilloma is not uncommon after that period.

It is very doubtful whether sarcoma and carcinoma can be separated in diagnosis unless the passage of a considerable fragment in the urine comes to the aid of the surgeon. It is well to bear in mind, though, that the sarcomas often exist as firm lobulated masses with some tendency at times to pedunculation, while the carcinomas are sessile, often little raised above the surrounding bladder walls and are more nodular and infiltrating, on the whole, than the sarcomas.

